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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/632,582	07/31/2003	Ilan Gavish	42P10059CD	5004

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EXAMINER

HASSANZADEH, PARVIZ

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 11/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/632,582

Applicant(s)

GAVISH ET AL.

TH

Examiner

Parviz Hassanzadeh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 September 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnishi et al (US Patent No. 5,120,925) in view of Kubena et al (US Patent No. 4,908,226), Hongo et al (US Patent No. 5,182,231) and Drummond et al (US Patent No. 5,132,248).

Ohnishi et al teach a system (Figs. 2, 3) comprising:

a chamber housing a substrate 200; an ion beam 100 (energy source) coupled to the chamber; a system controller 500 to control introduction of metal precursor gas 110 to a focus ion beam 1 and to control the ion beam generating unit (column 3, lines 9-34, column 8, lines 20-26), wherein the computer 500 inherently includes a memory having computer-readable program for controlling the operation of the system.

Ohnishi et al fail to teach a coherent electromagnetic radiation source to heat a metal layer formed on the substrate.

Kubena et al teach a focused ion beam processing apparatus (Fig. 1) including a vacuum chamber 22 disposed therein a substrate stage 24 having a heating element 28 heated by an electrical heating wire 30 in order to heat a substrate 32 supported on the heating element 28 to a desire temperature after a focus ion beam is scanned across the substrate (column 4, lines 29-66).

Hongo et al disclose an apparatus (Fig. 1) for forming metal layers using a focused ion beam (FIB) source 20 and a laser source 23. Hongo et al teach the use of the laser to decompose a metal precursor such as a metal carbonyl (col. 8, lines 42-49) to form a metal layer that contains impurities such as carbon, as well as to *anneal the metal layer to remove the impurities and to reduce the resistivity of the layer* (see Fig. 17, for example) by removing oxygen and carbon impurities (see col. 11, lines 41 -47). Hongo et al clearly demonstrate the utilization of laser beam for *heating and annealing the metal layer* . Further, Hongo et al teach the use of a *computer* controller 202 (see Fig. 20) to control the laser system.

Drummond et al teach an apparatus for forming a metal deposition on the surface of a substrate, wherein the *metal layer on the substrate is annealed by a radiation light source such as a laser source* (Fig. 1; column 3, lines 65-68; column 5, lines 27-37).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement a heating or annealing device as suggested by Kubena et al and in particular a laser beam heating or annealing source as taught by Hongo et al and Drummond et al in the system of Ohnishi et al in order to anneal the metal film formed on the substrate, the laser annealing provides high resolution while minimizing the overall thermal load of the substrate.

Further regarding claim 1: the computer 500 as taught by Ohnishi et al inherently includes a memory comprising a computer-readable medium having a computer-readable

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program having instructions for controlling the overall operation of the apparatus. It is also noticed that laser beam sources as taught by Hongo et al and Drummond et al are under *computer* control. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the computer instructions of the laser beam source into the computer of the Ohnishi et al so that the entire apparatus can be operated under a common programmed computer control.

Further regarding claim 2: Kubena et al disclose iron pentacarbony (a metal carbonyl) as precursor (column 6, lines 20-24 and column 7, lines 41-60); and Hongo disclose a series of metal carbonyl compounds such Mo(CO)₆, Cr(CO)₆, W(CO)₆, W as metal precursor (column 8, lines 43-49).

Further, The type of the metal, the chamber pressure, and the thickness of the formed layer are considered process limitation rather than structural limitations and the apparatus as discussed above is capable of being used for forming, for example, platinum under the condition recited in the claims. The particular type of gas used is a process limitation rather than an apparatus limitation, and the recitation of a particular type of gas does not limit an apparatus claim, see *In re Casey*, 152 USPQ 235; *In re Rishoi*, 94 USPQ 71; *In re Young*, 25 USPQ 69; *In re Dulberg*, 129 USPQ 348; *Ex parte Thibault*, 64 USPQ 666; and *Ex parte Masham*, 2 USPQ2d 1647. This rejection is based on the fact the apparatus structure taught by prior art has the inherent capability of being used in the manner intended by the Applicant. When a rejection is based on the inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112)

It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531, (CCPQ 1959); “Apparatus claims cover what a device is, not what a device does” (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

Further regarding claims 3, 9: as shown in Fig. 3 of Ohnishi et al, the apparatus includes a vacuum exhaust system under control and capable of operating under typical pressure used in ion beam processing. Hongo et al teach typical pressure in ion beam processing being 1×10^{-5} Torr or less (column 5, lines 30-37).

Further regarding claim 4: The ion beam taught by Ohnishi et al is a focus ion beam and thus would inherently heat a discrete area on the layer. As shown in Fig. 2, the ion beam includes objective lens 106 for focusing the ion beam 1 on discrete area on the layer and thus inherently heat the discrete area on the layer.

Further regarding claims 5-7: the laser source as taught by Hongo et al (Fig. 20) includes objective lens 26 for focusing the laser beam 24 to a spot size on the substrate. Further, the selection of an appropriate focusing lens to focus the laser radiation to a desired spot size suitable for the annealing at high resolution is considered to have been obvious to and within the general knowledge of one of ordinary skill in the art at the time of the invention. For example Hongo et

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al disclose laser spot sizes of about 3 and 6 micron in diameter (column 11, line 61 through column 12, line 9).

Further regarding claim 8: Hongo et al further disclose typical thickness of the metal layer formed being in the range of 0.2 to 2 micron (column 8, lines 50-68). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to maintain the thickness of the metal layer formed within the range taught by Hongo et al.

Further regarding claim 10: The laser beam of Hongo et al is capable of removing carbon and oxygen as impurities associated with metal carbonyl precursor (column 11, lines 40-47).

Further regarding claims 11, 12: It is held *in re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) that a mere duplication of parts has no patentable significance unless a new and unexpected result is produced therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a plurality of metal precursor gases in order to introduce different metal precursor gases into the chamber separately or simultaneously as desired.

Further regarding claims 13, 14: The laser source of Hongo et al can be operated at wide output power as shown in Fig. 12 suitable for annealing and recrystallization of the metal formed on the substrate (see column 11 and 12 for typical laser output power).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686

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F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-12 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-6 of copending Application No. 10/209,453. Although the conflicting claims are not identical, they are not patentably distinct from each other because the structural limitations in both cases are obvious and similar variation of each other.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Arguments

Applicant's arguments with respect to claims 1-14 have been considered but are moot in view of the new ground(s) of rejection.

Applicants assert that Drummond et al teach a low power laser to adhere a colloidal deposit rather than a coherent electromagnetic radiation source for applying "radiation" on a top surface of the at least one layer to heat the at least one layer.

Examiner argues that Drummond et al is relied upon for teaching a laser for performing an annealing process as high resolution on a material deposited onto a top surface of a substrate. Drummond et al is not used for teach focused ion beam, the focus ion beam deposition is taught by Ohnishi et al. Furthermore, claims do not specify the power level of the laser source.

Applicants assert that Kubena et al do not disclose a coherent electromagnetic radiation source.

Examiner argues that Kubena et al is relied upon for teaching an annealing device implemented into a focused ion beam apparatus. Drummond et al and Hongo et al are relied upon for teaching advantageous of implementing laser source as annealing device in the focused ion beam apparatus of Ohnishi et al.

Applicants assert that Hongo et al teach using a focused ion beam or *alternatively* using a laser beam during a chemical vapor deposition rather than using the laser source for applying radiation on deposition layer formed by a focused ion beam.

Examiner argues that Hongo et al teach the use of the laser to decompose a metal precursor such as a metal carbonyl (col. 8, lines 42-49) to form a metal layer that contains impurities such as carbon, as well as to *anneal the metal layer to remove the impurities and to reduce the resistivity of the layer* (see Fig. 17, for example) by removing oxygen and carbon impurities (see col. 11, lines 41 -47). Hongo et al clearly demonstrate the utilization of laser beam for *heating and annealing the metal layer*.

Furthermore, claim 1 does not recited whether the laser source is used for annealing after a deposition layer is formed by a focused ion beam or whether the laser source is used for other purposes such as for laser CVD process or laser etching process, wherein in either of these processing a top surface of a deposition layer is heated inherently.

Furthermore, claim 1 does not recited whether the focused ion beam and the laser source are arranged within the same chamber or whether they are disposed in different chambers of a cluster too or whether the substrate is not displaced to different regions within the same chamber

during deposition and annealing. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., low power laser) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicants assert that the computer program instruction limitation are not taught by the prior art or record.

Examiner argues that the computer 500 as taught by Ohnishi et al inherently includes a memory comprising a computer-readable medium having a computer-readable program having instructions for controlling the overall operation of the apparatus. It is also noticed that laser beam sources as taught by Hongo et al and Drummond et al are under *computer* control, wherein the computer is in communication with other processing units as shown in Fig. 20 of Hongo et al and Fig. 1 of Drummond et al, implying that the computer having programmed instructions for controlling various functions including the laser source. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the computer

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instructions of the laser beam source into the computer of the Ohnishi et al so that the entire apparatus can be operated under a common programmed computer control.

Applicants assert that the teachings of Drummond et al, use of laser for annealing, is not relevant to the ion beam processing. The Examiner argues that annealing in the art of ion beam processing is well known by using either heating the substrate support as taught by Kubena et al or by using laser beam as taught by Hongo et al. Further, incorporation of the laser annealing unit and the associated computer controlling programs into the computer of the ion beam apparatus of Ohnishi et al is considered to have been obvious to one of ordinary skill in the art at the time of the invention so that the entire operation of the apparatus is controlled through a central computer.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Tao et al (US Patent No. 5,104,684) teach an ion beam metal deposition system;

Azuma et al (US Patent No. 5,976,328) teach an ion beam processing system wherein the surface of a metal film is heated by a radiation source (column 7, lines 24-68).

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Parviz Hassanzadeh whose telephone number is (571)272-1435. The examiner can normally be reached on Tuesday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571)272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

P. Hassanzadeh
Parviz Hassanzadeh
Primary Examiner
Art Unit 1763

October 29, 2004